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14. ABSTRACT

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36 Separate items are enclosed

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MEMORANDUM FOR PR (Contractor/In-House Publication)

FROM: PROI (TI) (STINFO) 06 Jul 2000

SUBJECT: Authorization for Release of Technical Information, Control Number: **AFRL-PR-ED-TP-2000-148**
C.T. Liu; J.N. Yang (UC Irvine), "Determination of Equivalent Initial Flaw Size in Particulate Composite Material"

8th Specialty Conference on Probabilistic Mechanics and Structural Reliability (Statement A)
(Notre Dame, IN, 24-26 Jul 00) (Submission Deadline: 18 Jul 00)

1. This request has been reviewed by the Foreign Disclosure Office for: a.) appropriateness of distribution statement, b.) military/national critical technology, c.) export controls or distribution restrictions, d.) appropriateness for release to a foreign nation, and e.) technical sensitivity and/or economic sensitivity.
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APPROVED/APPROVED AS AMENDED/DISAPPROVED

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Determination of Equivalent Initial Flaw Size in a Particulate Composite Material

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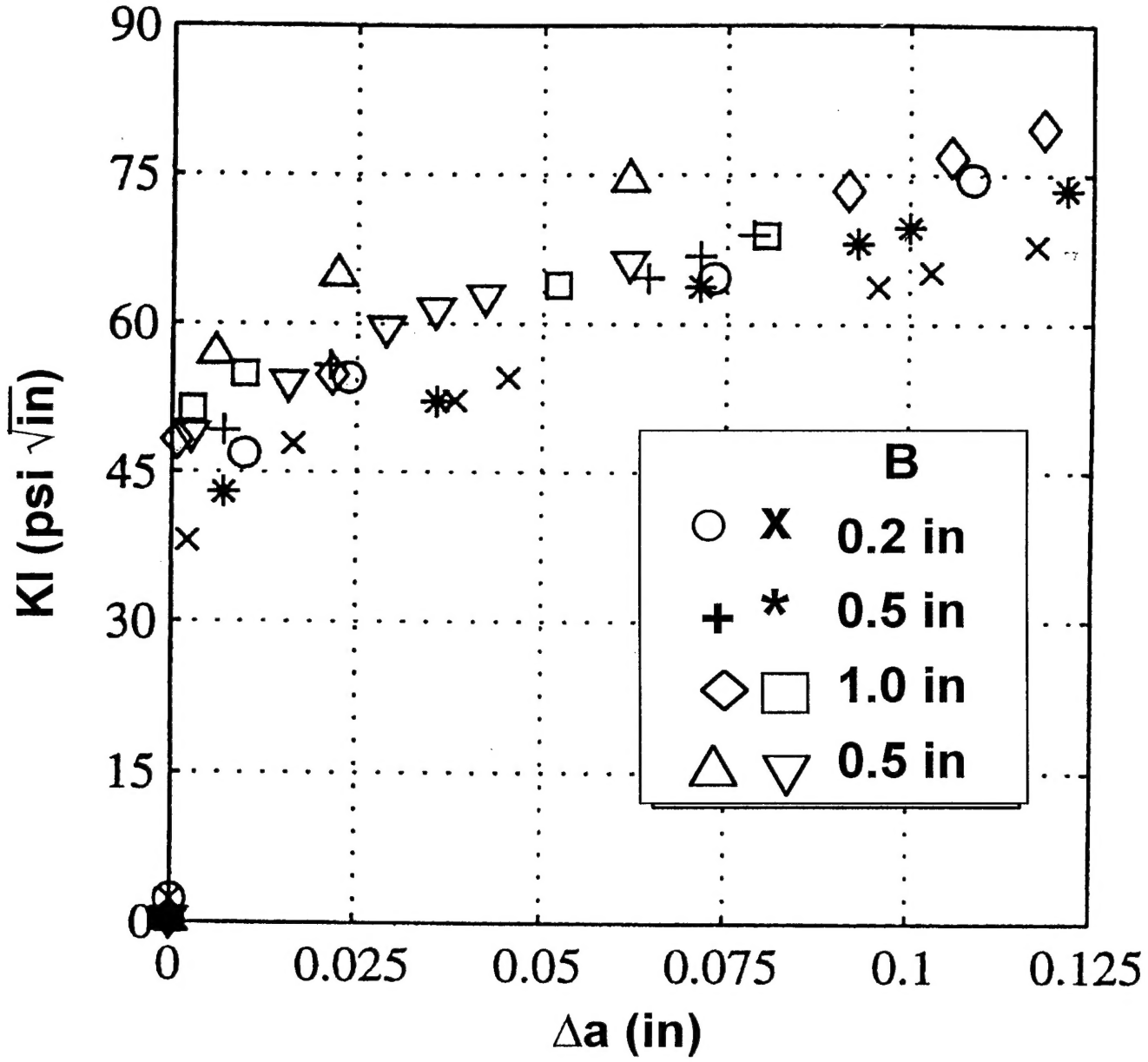
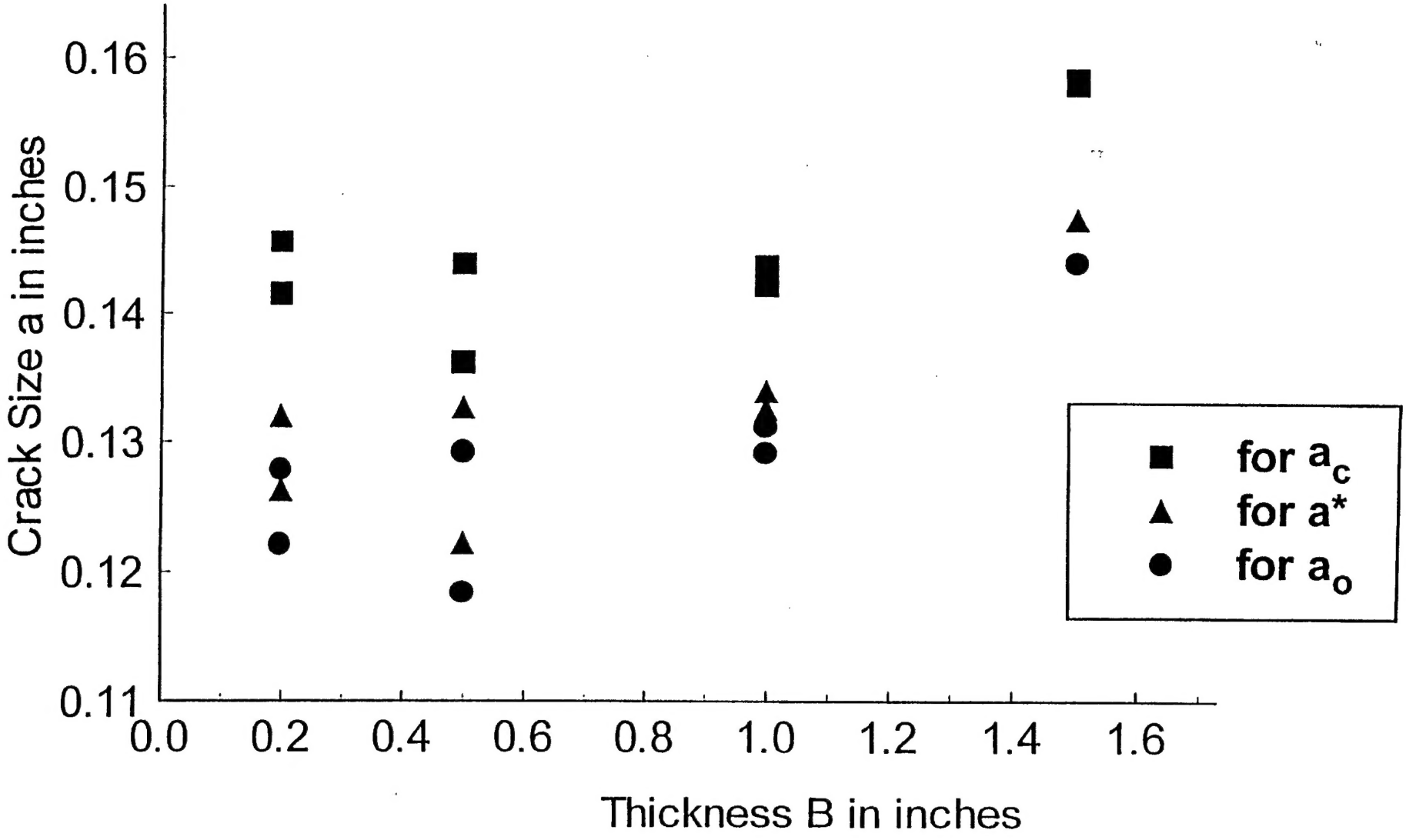
Objectives

- **Investigate the Effect of Specimen Thickness on the Equivalent Initial and the Critical Flaw Sizes in a Particulate Composite Material.**
- **Determine the Statistical Distribution Function of the Equivalent Initial and the Critical Flaw Sizes.**
  - **Normal Distribution**
  - **Two parameter Lognormal Distribution**
  - **Two Parameter Weibull Distribution**
  - **Second Asymptotic Distribution of Maximum Value**

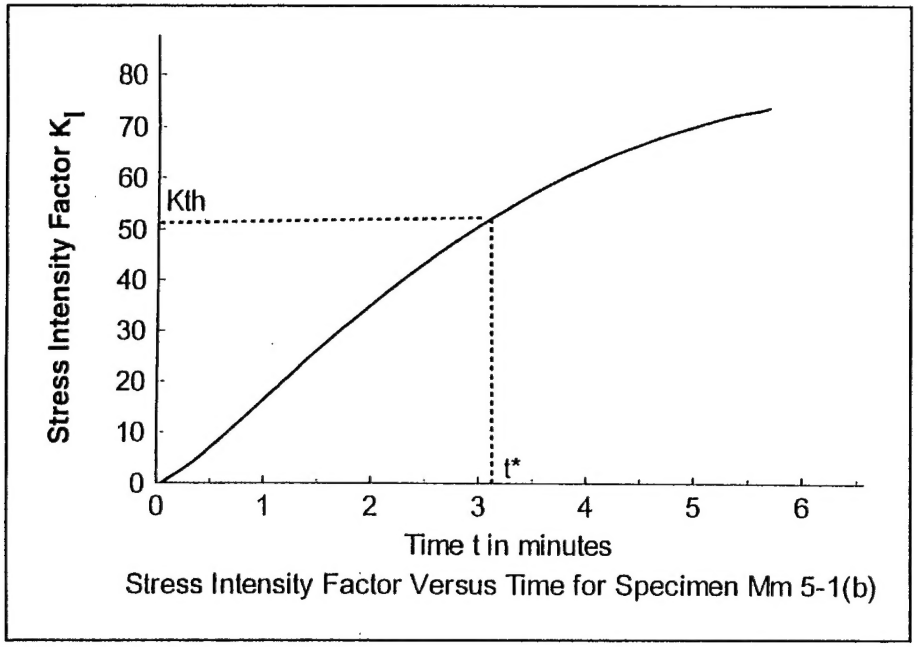
Crack Growth Resistance Curve



Equivalent Initial Flaw Size and Critical Flaw Size

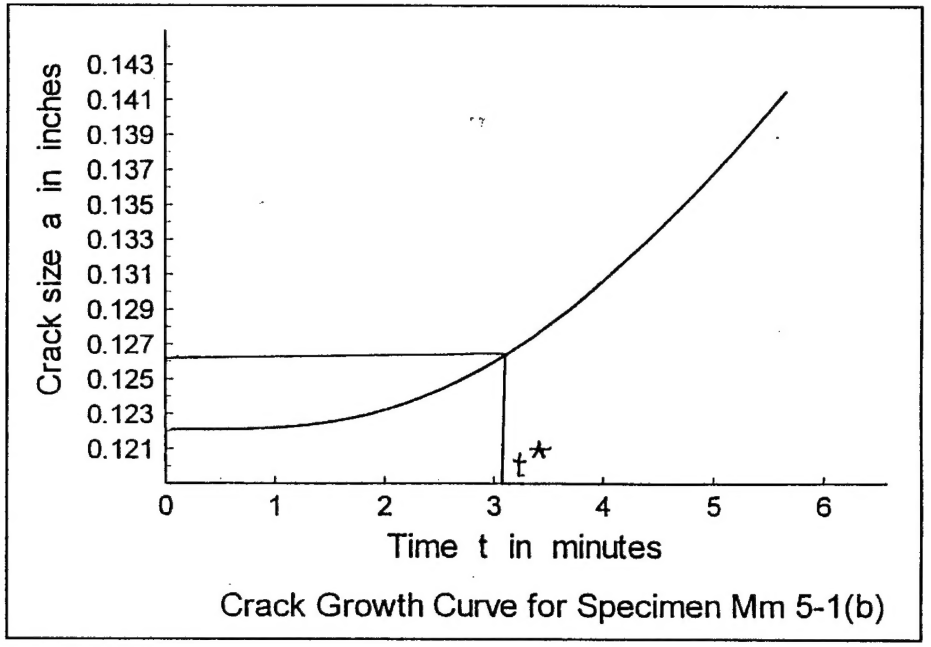


Stress Intensity Factor Versus Time for Specimen Mm 5-1 (b)



Stress Intensity Factor Versus Time for Specimen Mm 5-1(b)

a



Crack Growth Curve for Specimen Mm 5-1(b)

b

Equivalent Initial Flaw Size and Critical Flaw Size

lower case in plots

Test Specimen	Thickness B inches	Width W inches	A_0 inches	A^* inches	T^* minutes	A_c inches
Mm 5-1b.mad	0.198	1.000	0.122088	0.1263	3.0755	0.1415
Mm 2-2.mad			0.127880	0.1320	2.9113	0.1456
Mm 5-1.mad	0.498	1.000	0.118401	0.1222	2.8465	0.1362
Mm 5-2.mad			0.129210	0.1327	2.7359	0.1439
Mm 1-1.mad	0.997	1.000	0.131190	0.1340	2.0768	0.1422
Mm 1-2.mad(a)			0.129168	0.1326	2.4384	0.1438
Mm 1-2.mad(a)	1.500	1.050	0.144033	0.1475	2.4900	0.1580
Mm 15-2.mad			0.144086	0.1475	2.4644	0.1584

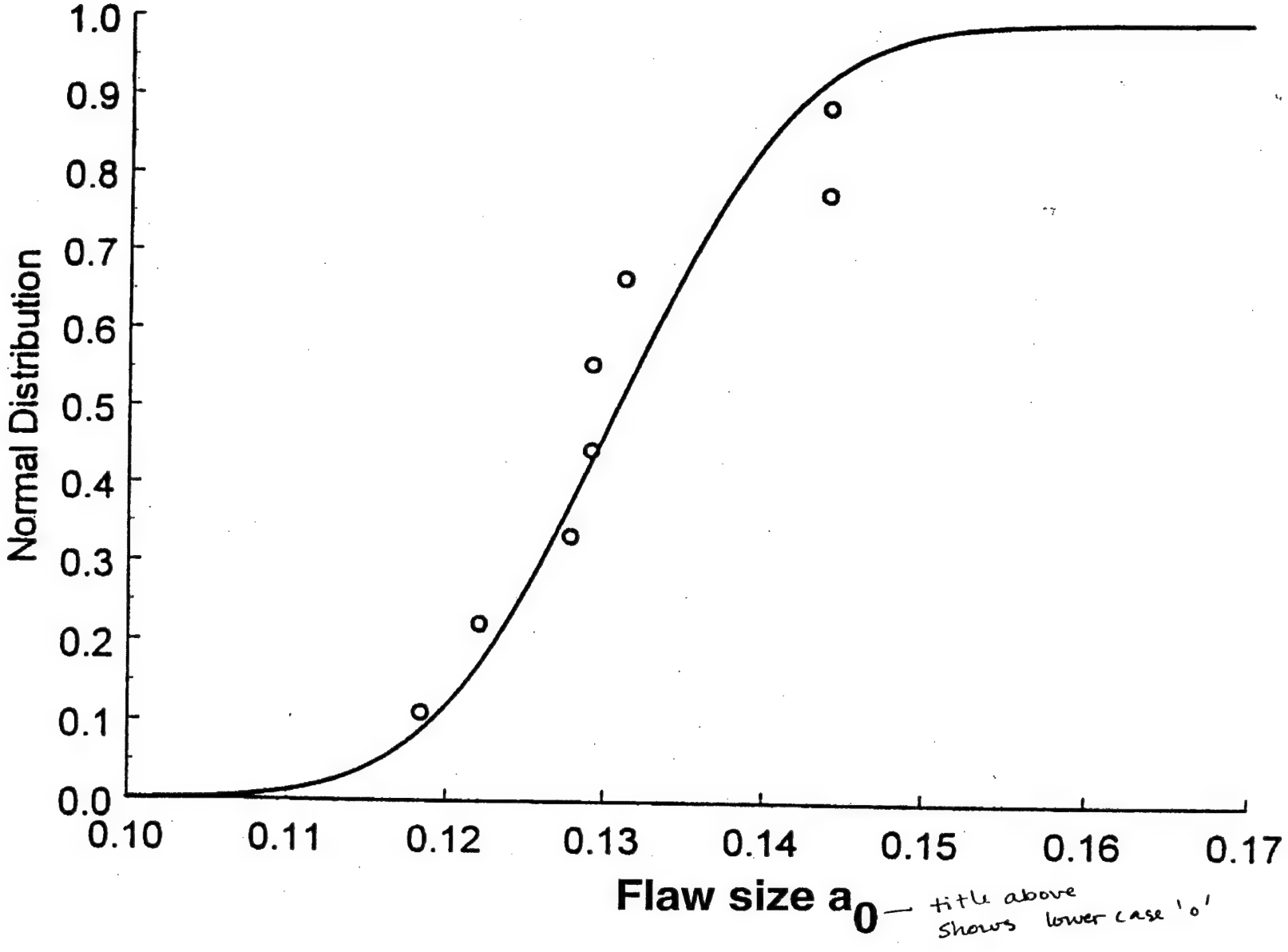
Distribution Parameters for Normal, Lognormal, Weibull and Asymptotic Distributions

	A_0	A^*	A_c
μ	0.1308	0.1344	0.1462
s	0.0092	0.0090	0.0079
μ^*	-2.037	-2.0092	-1.9242
σ^*	0.07021	0.06692	0.053961
α	17.5546	18.4513	23.0450
β	0.1348	0.1383	0.1497
k	13.2524	13.80.81	17.1205
υ	0.1258	0.2195	0.1419

Mean, Standard Deviation and Coefficient of Variation

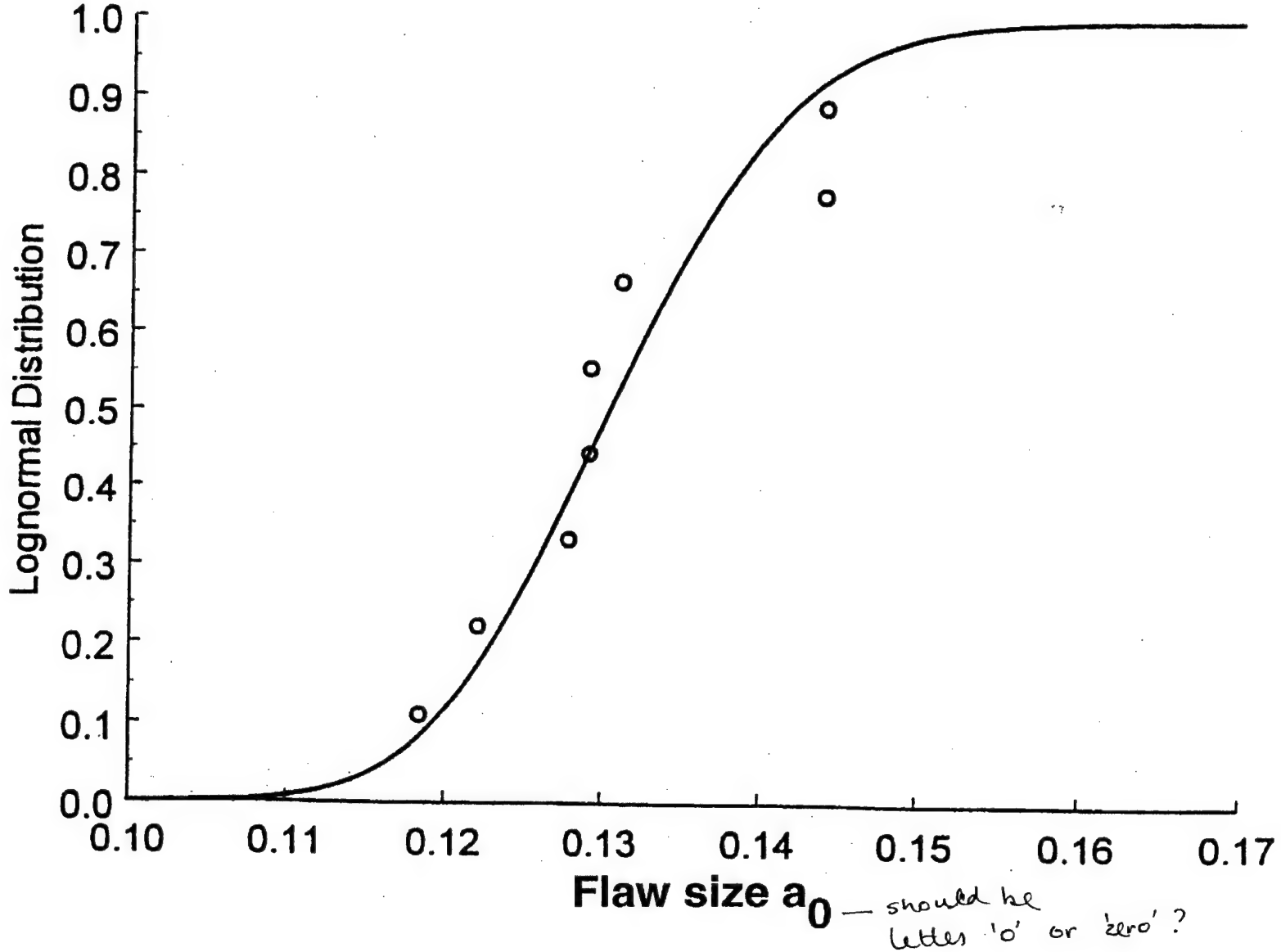
	A_o	A^*	a_c
Mean (in.)	0.1308	0.1344	0.1462
Standard Deviation (in.)	0.0092	0.0090	0.0079
Coefficient of Variation	0.0703	0.0670	0.0540

Normal Distribution Plot for a_o



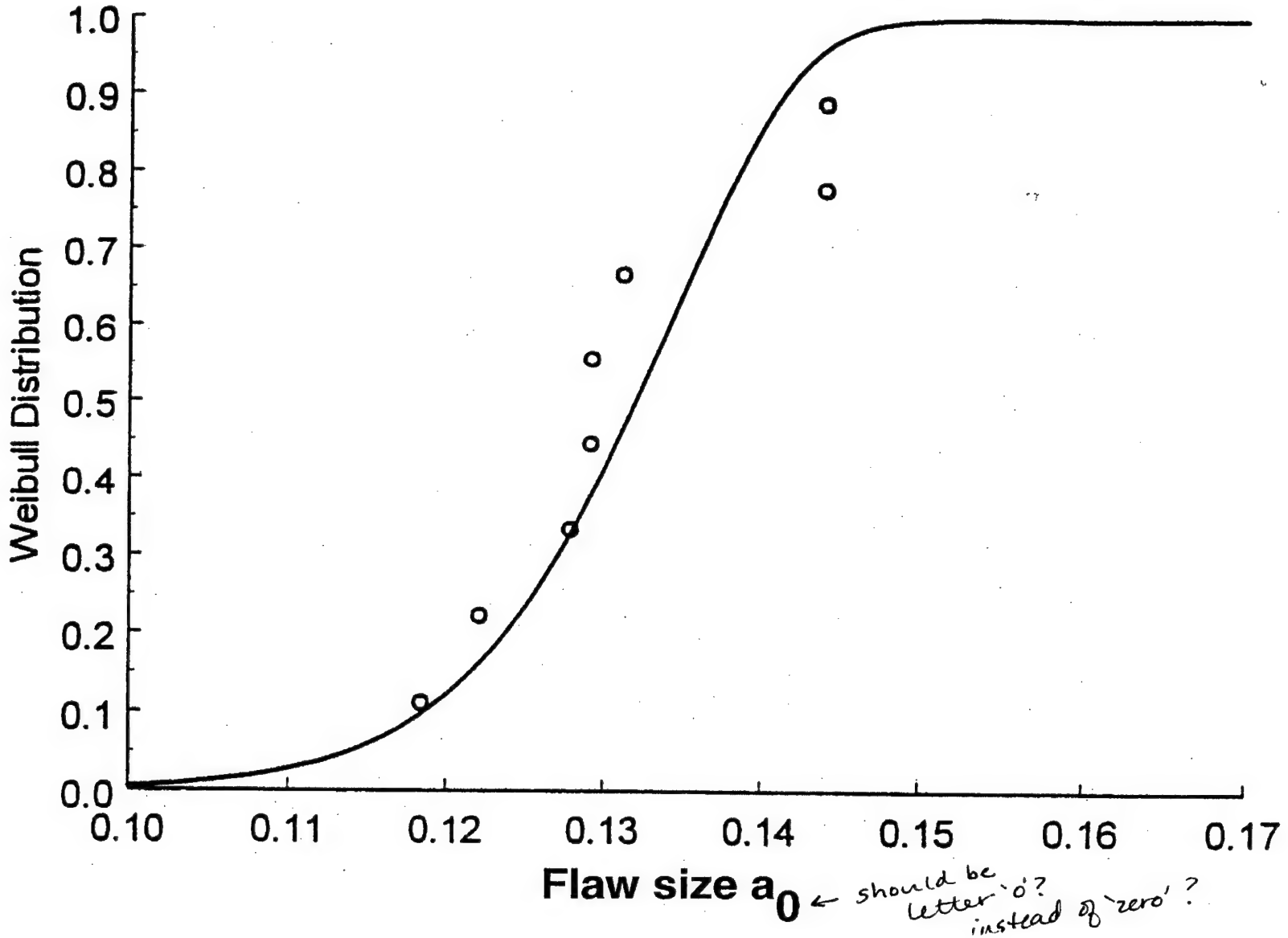
title above shows lower case 'o'

Lognormal Distribution Plot for a_o

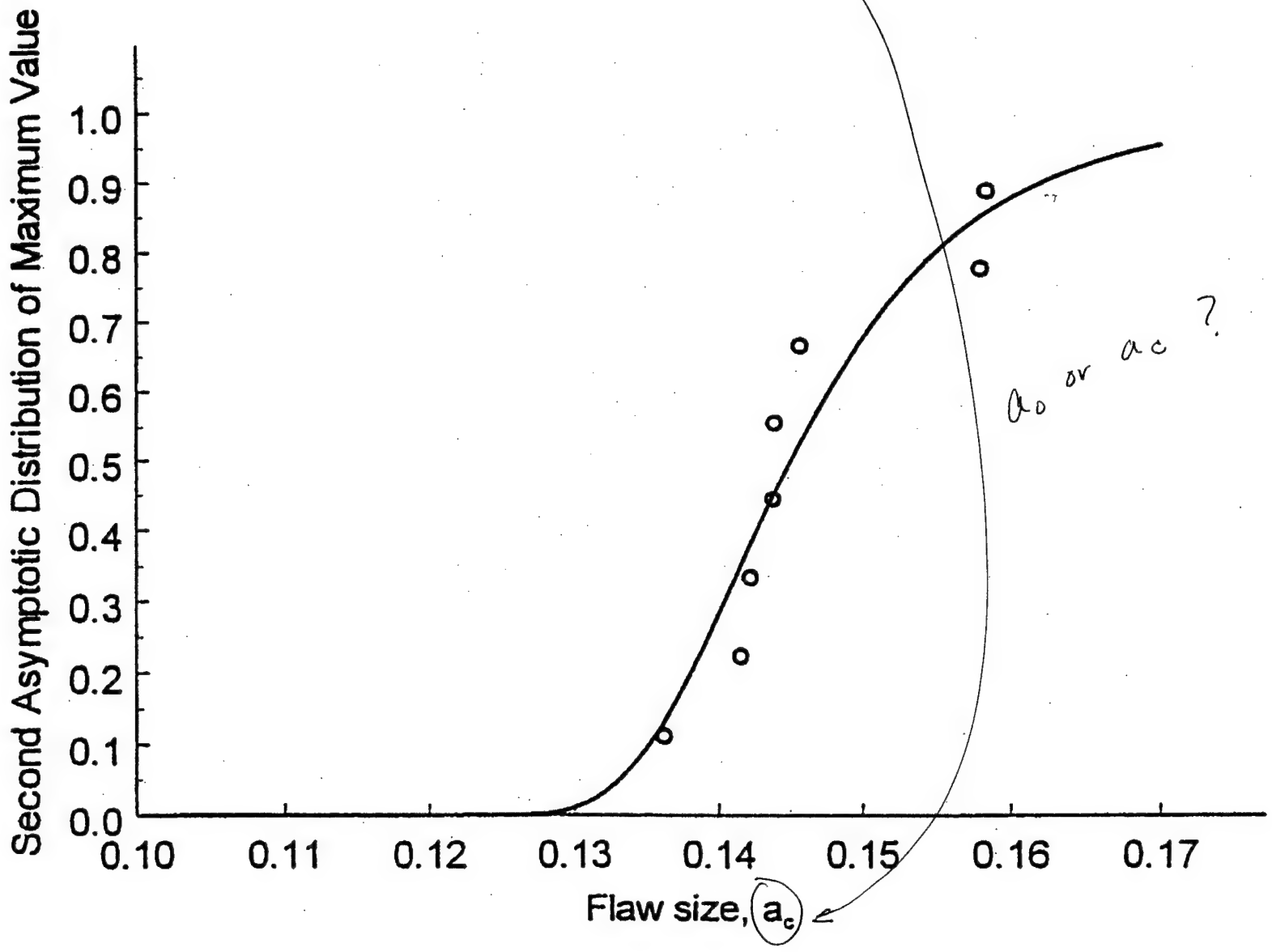


should he letter 'o' or 'zero'?

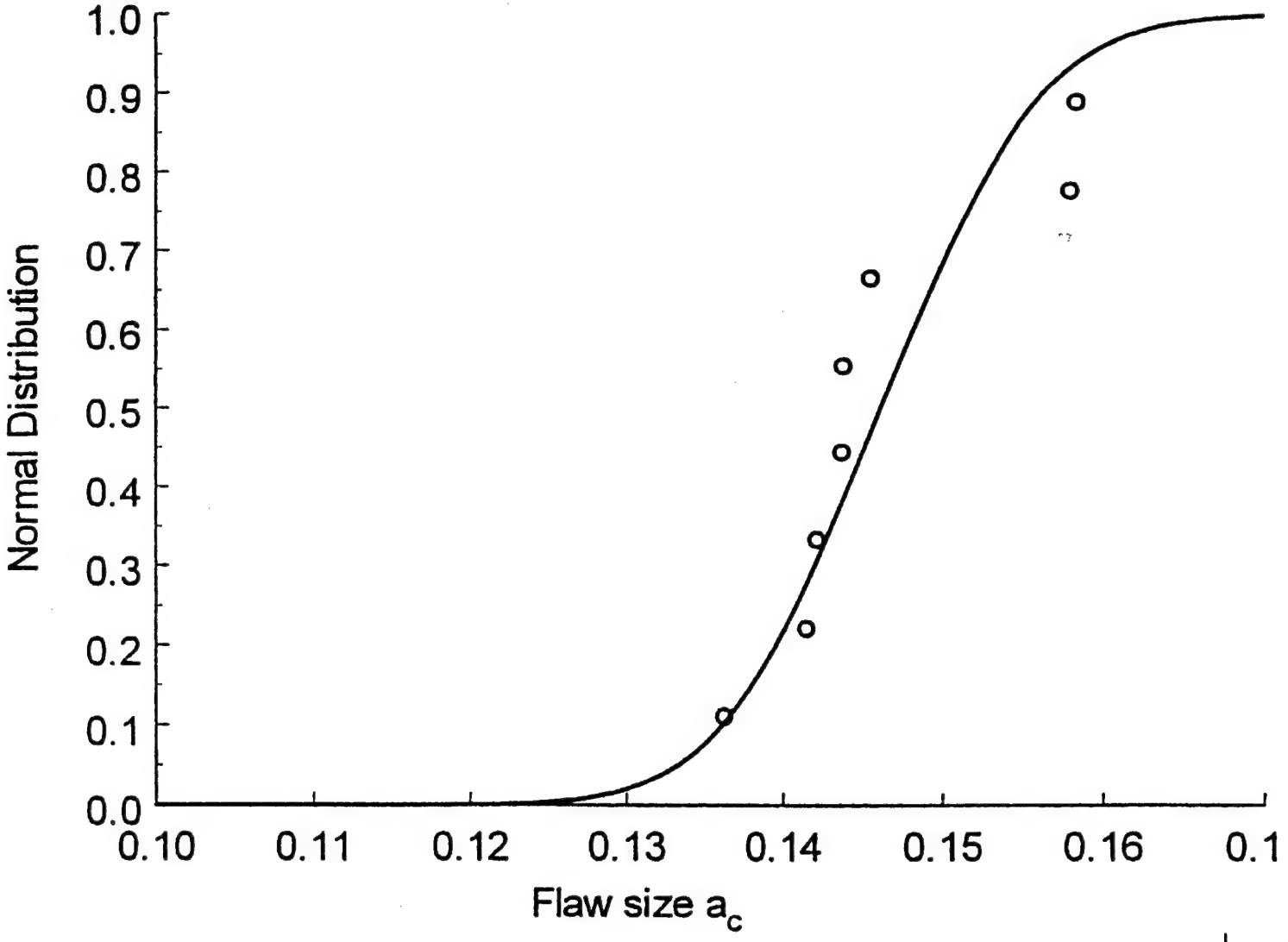
Weibull Distribution Plot for a_o



Second Asymptotic Distribution Plot for a_o

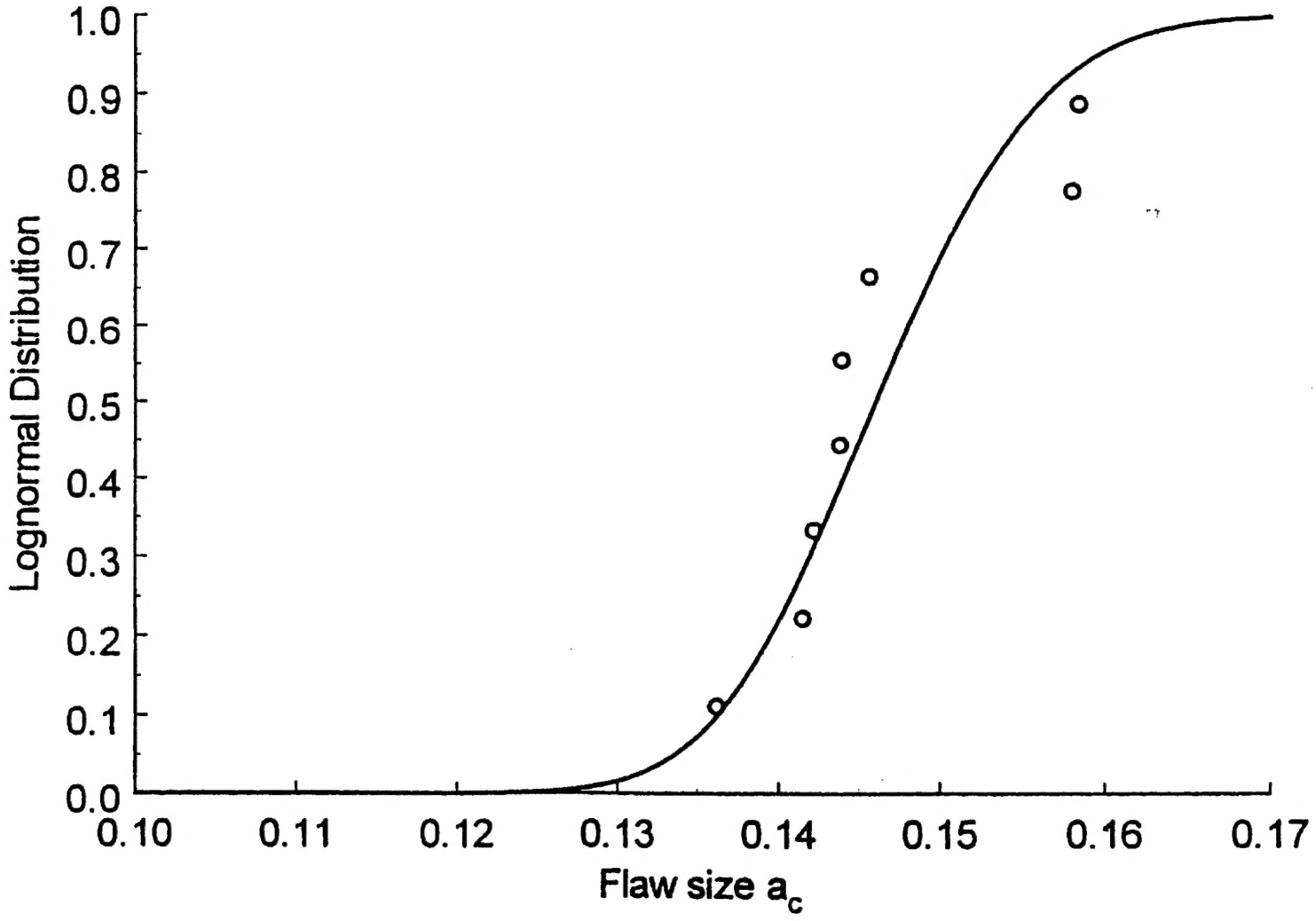


Normal Distribution Plot for a_c



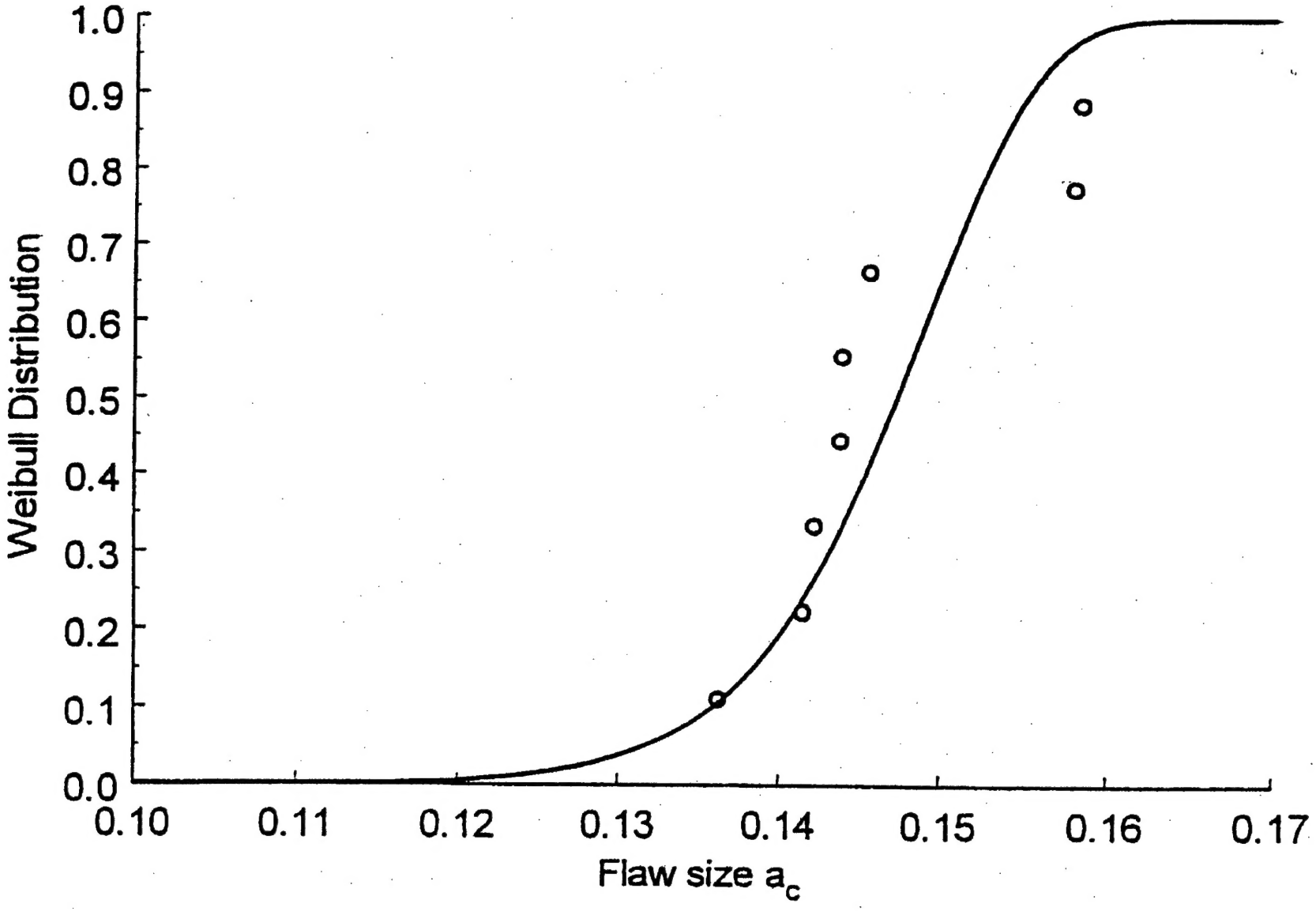
~~Normal Distribution plot for a_c~~ already title at top

Lognormal Distribution Plot for a_c

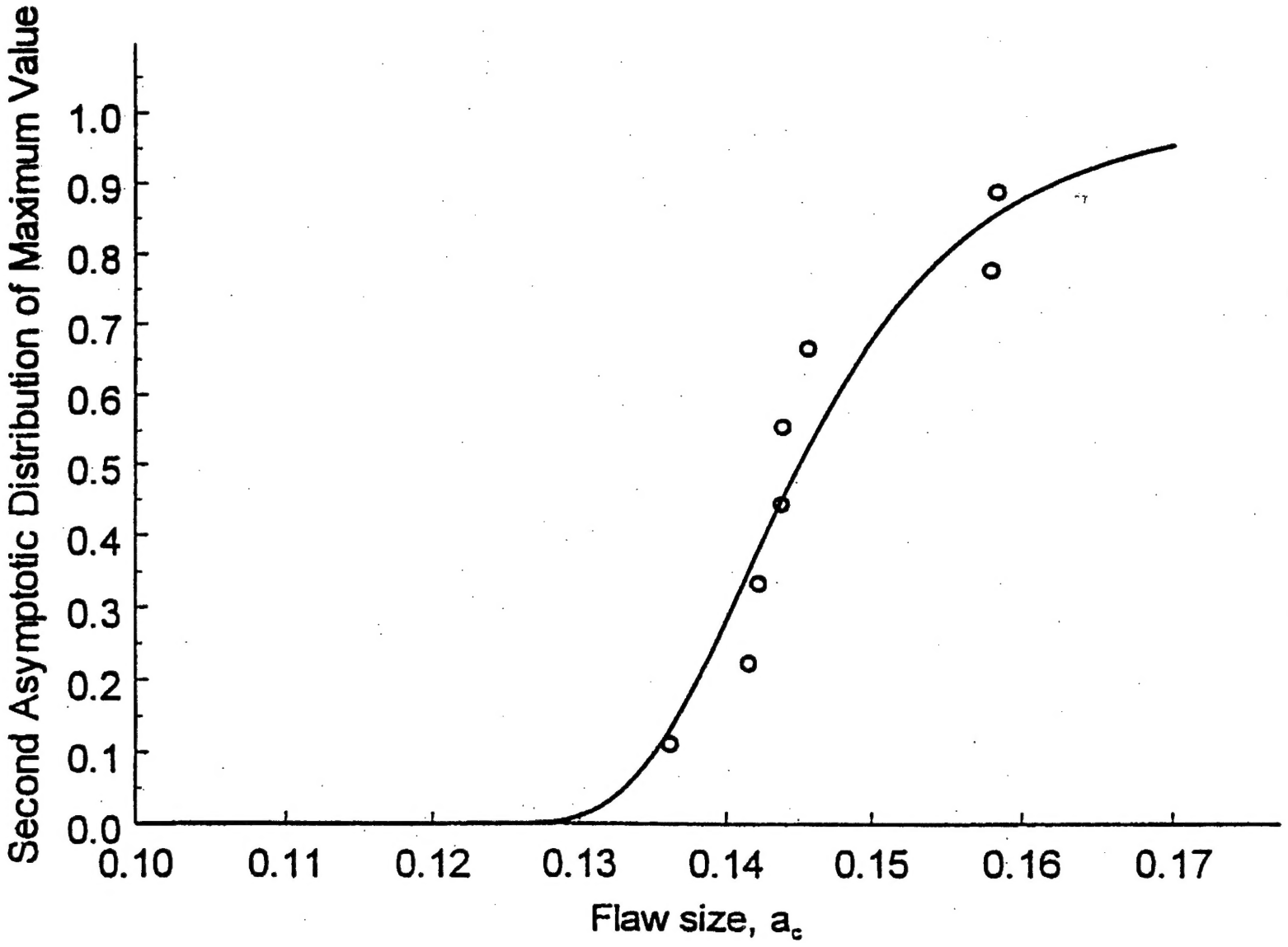


Lognormal Distribution plot for a_c

Weibull Distribution Plot for a_c



Second Asymptotic Distribution Plot for a_c



Conclusions

- The equivalent initial and the critical flaw sizes are insensitive to the specimen thickness.

- The equivalent initial and the critical flaw sizes follow the second asymptotic distribution of the maximum value.